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A report on instructional sound motion pictures is presented. The first section of the report involves the area of psychological learning principles and their relationships to learning from films. The learning principles investigated are: the greater the motivation, the greater the learning; the individual learns only by his own activity, and the more active the mental or physical learning behavior, the greater the learning; the learner acquires and repeats those actions which lead to success in a situation, which satisfy the motivating conditions, or which are perceived as means to desired ends; and the characteristics of the learner affect his ability to learn.

The second section involves film characteristics; their effects on learning; and proposed investigations to determine the relative effectiveness of such film variables as color, music, voice characteristics, emotional tone, and humor under various conditions of learning.

The last three sections involve the development of new equipment and procedures for testing instructional films, the research on methods of utilizing films in instruction, and the reviews of pertinent literature and theoretical systems.

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LEARNING THEORIES AND INSTRUCTIONAL FILM RESEARCH

(Rapid Mass Learning)

The Pennsylvania State College
Instructional Film Research Program
June 1949

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Report Prepared by

Kinsley R. Smith
E. B. vanOrmer

- -

FOR THE PENNSYLVANIA STATE COLLEGE:

Dean M. R. Trabue
Responsible Administrator

C. R. Carpenter
Program Director

- -

FOR THE SPECIAL DEVICES CENTER

Reviewed for Human Engineering Branch:

J. Gaberman, Project Engineer

C. P. Seitz, Head, Code 912

Submitted:

Fred W. Tittler Capt USN
for C. S. Rhoads, Technical Director

Approved:

C Gordon Cdr, USN
for J. R. Ruhsenberger, Captain, USN
Commanding Officer and Director

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LEARNING THEORIES AND INSTRUCTIONAL FILM RESEARCH

by

Kinsley R. Smith
E. B. vanOrmer
Instructional Film Research Program
The Pennsylvania State College

INTRODUCTION

In the early planning and development stages of the Instructional Film Research Program, it was realized that a systematic approach to the field of research problems relating to instructional sound motion pictures was a necessity. The need was also seen for a classification of the various specific research problems which came to the foreground in staff conferences. Accordingly a conceptual framework was evolved which would serve to indicate areas in which research on instructional sound motion pictures might be profitably conducted.

The primary purpose of the present report is to provide an outline of this frame of reference. The framework has proved to be a useful working guide for the Instructional Film Research Program. Perhaps it may be of assistance to other research workers, not only in the field of instructional films but also in the closely related fields of "mass instruction" by radio and television.

This classification has five major sections: (I) the area of psychological learning principles and their relationship to learning from films, (II) the area of instructional film characteristics and their influence on learning, (III) the area of the development of equipment and procedures for testing instructional films, (IV) the area of research on methods of utilizing films in instruction, and (V) the area of reviews of pertinent literature and theoretical systems. Each of these major areas will be considered in a separate section of the report which follows.

I. THE AREA OF PSYCHOLOGICAL LEARNING PRINCIPLES AND THEIR RELATIONSHIP TO LEARNING FROM FILMS

This section contains a statement of principles and hypotheses of effective learning. Each of these principles delineates a sub-area of research inasmuch as each might be applied (and certainly some, with more or less systematic intent, have been applied) to instructional films.

This section of the report is based on reviews, digests, analyses of experimental reports from various areas of learning, including learning from films. There is no assurance, however, that principles of effective learning as currently formulated and derived in non-film situations can be directly carried over and applied to instruction by films; in fact it is almost certain that this cannot be done universally. Nor, for that matter, can a learning principle revealed in the use of a certain film be transferred, without verification, to other films or classes of films.

The following list of principles is viewed therefore as a systematically arranged body of general psychological learning principles which should be subjected to experimental testing in the film medium.

A number of the problems relating to instructional films, which were proposed for research under the Instructional Film Research Program, seemed to be closely related to one or more of these principles, and where possible the experimental design was modified in order to include investigation of them. Other projects were concerned from the outset with determining the effectiveness of certain of these principles in the motion picture medium. The extent of these investigations is shown in the appendix to this report.

The statement of learning principles now follows in outline:

A. MOTIVATION AND INCENTIVES

The learner must feel an urge (desire, drive, need, set, tension) to learn certain things if there is to be much learning (any complex learning). Within certain limits the more intense the motivation the greater will be the learning. Several sub-principles fall under this major precept:

1. EFFECTIVENESS OF GOALS. The goals to be achieved in the learning will serve to strengthen motivation to the extent that they are:

    a. Clear to the learner. E.g., learning is favored by an initial definite statement of the overall goal and by specific statements of the goals of each learning period - what the learner is expected to learn.

b. Accepted by the learner as desirable to achieve.

c. Attainable. With reasonable effort most learners should be able to achieve the goal established. In attaining an ultimate goal it may be desirable to set successive sub-goals.

2. KNOWLEDGE OF PROGRESS. When the learner is informed of his progress from time to time, motivation is usually sustained and strengthened.

3. PRAISE AND REPROOF. Praise for correct answers, or good performance, is frequently more motivating than reproof for a poor performance. Wise use of praise or reproof takes into account the makeup of the individual learner, his reaction under similar previous conditions, and the lasting influence of the praise or reproof on his learning attitude.

4. SUGGESTION. Positive suggestion, namely that mastery is possible or probable, aids motivation, whereas negative suggestion hampers motivation.

5. REALISM AND PRACTICABILITY. Motivation is favored when the material is presented in a realistic way, and in such a manner as to make clear the practicability of the material and the way in which it is actually used in practice.

6. ANTICIPATION OF EARLY USE. Motivation is strengthened when the learner is led to anticipate a use for the material in the near future.

7. EXAMINATION SET. Knowledge that there will be an examination on the material presented to be learned generally strengthens motivation.

8. CHALLENGE. An instructional presentation will motivate learners if it involves a challenge, and if in closing it stresses a challenge rather than a note of finality.

B. SELF ACTIVITY

The individual learns only by his own activity (mental and/or physical). What he learns are the responses (mental and/or physical) he makes and organizes. Within certain limits, the more active the mental or physical learning behavior, the greater will be the learning.

1. MENTAL PRACTICE OF A PROCESS. Learning a skill from a demonstration (as in a film) is enhanced when the learner himself (possibly during pauses in the demonstration and with direction for such mental practice):

a. Verbalizes the task: Formulates or restates verbal descriptions for the task.

b. Visualizes the task: Mentally pictures the performance.

c. Imagines the feeling of the task: Imagines the feeling of going through the motions of the task.

2. RAISING AND ANSWERING QUESTIONS IN PRESENTATION. Mental participation is enhanced if questions addressed to the group as a whole are interspersed with intervals of straight information:

a. When questions are presented and the learner is required to answer.

b. When questions are presented, even though there is no expectation of the group's being able to answer them (question followed by slight pause and then answer given, e.g. "What happens when.....?)

3. LEARNER PROTAGONIST. Vicarious participation of the learner through use of a learner protagonist in the learning situation, may aid learning.

C. SEEING AND ORGANIZING RELATIONSHIPS

The learner ordinarily has some tendency to see and organize patterns or relationships in the material or activities which he is learning. But this tendency cannot be trusted to form the desired relationship unaided. This organizing process must be directed and facilitated for effective learning.

1. MEANINGFULNESS. The more meaningful the material to the learner, the more readily it is organized and learned.

a. Meaningfulness generally is enhanced by:

(1) Use of simple words familiar to the learner, and explanation of all unfamiliar and technical terms when necessarily used.

(2) Relation of new material to the learner's past experience by illustrations and analogies.

(3) A preliminary overview of the whole pattern of the material or process to be learned (i.e. an introduction).

(4) Having equipment or processes shown to the learner in the same relative position which these would have when viewed by him in actual practice or use.

(5) Adequate emphasis on essential details or features.

(6) Explanation of reasons why things should be done, if not too detailed.

(7) In some cases, explanation of how mechanism works. However, there is a danger of too extensive explanation early in learning.

(8) Reviews or summaries after logical units of material during each period of presentation, and at end of presentation.

b. Meaningfulness in the case of concepts is enhanced by:

(1) Varied experiences: presentation of varied, specific, realistic situations in which concept is illustrated and named.

(2) Simplified symbols: in certain cases of learning complex materials, representing these materials by simplified symbols.

(3) Personalization: representation of concepts by human or cartoon characters.

(4) Contrasts and similarities: clearly indicating differences and likenesses among concepts.

2. PATTERNING. Organization and learning are facilitated when the material is grouped into patterns in presentation, such as:

a. Functional patterns (as three interfunctioning parts of a gun).

b. Spatial patterns (as grouping of instruments on a panel).

c. Temporal patterns (rhythm in complex movements, as crew loading a gun).

d. Logical patterns (as precautions in ammunition room to avoid sparks, logically related because of common hazard).

3. IDENTIFIABILITY. Responses to a situation are easier to learn as the situation is more easily identifiable, or distinguishable from others (as necessary in assembly of four similar parts of a gun trigger mechanism).

D. THE PRINCIPLE OF EFFECT (reinforcement of responses)

In much learning a selective process occurs in which the individual tends to acquire and repeat those actions which have one or more of the following: (a) led to success in that situation, (b) tended to satisfy the motivating conditions, and (c) been perceived as means to desired ends.

Unsuccessful or annoying responses tend to be avoided and to shift the learner's activity to other actions (which may lead to success).

1. CHECKING OR OK BY THE LEARNER. For the fullest operation of this principle, it is desirable that there be a checking or "OK" of the successes in the mind of the learner (the "confirming reaction").

2. DEMONSTRATION OF WRONG METHOD. Once the right method is at least partially established, a vivid demonstration of the wrong method reinforces the right method provided the consequences of the wrong method are stressed.

E. PRACTICE AND/OR REPEATED PRESENTATION

Mere practice or repeated presentation of material has very little, if any, strengthening effect upon learning. Repetition apparently merely affords the opportunity for strengthening or weakening factors to affect the learning.

1. EXERCISE UNDER FAVORABLE CONDITIONS. Other things being equal, the progress of learning will depend upon the frequency of repetition under favorable conditions (motivation, effect, meaningfulness, etc.).

2. OVERLEARNING. Retention is favored if, in the initial learning, the material is practiced or repeated in presentation beyond the point of its being barely learned. However, repetition, or continuation of practice or presentation beyond the point where fatigue or boredom seriously occurs may have a negative effect upon the learning. Varied repetition (variation of non-essential details) tends to offset fatigue and boredom.

3. REALISTIC PRACTICE. It is usually advisable to practice an activity, as nearly as feasible, in the way in which it will be used or needed in the future.

4. PART-WHOLE PRACTICE. The relative effectiveness of a whole-part-whole learning sequence in practicing, versus learning the parts and then combining them, depends upon the degree of integration, difficulty, and length of material, and upon the ability of the learner.

(E.g., if a task is too difficult, or too long, to be learned efficiently as a unit, it may be desirable to break it into meaningful units, still stressing relationships to the whole).

5. SPACED PRACTICE. Under many conditions learning is favored when practice periods are spaced over intervals of time rather than massed together.

6. MINIMUM DELAY OF PRACTICE. The sooner the practice follows the instruction, the greater the benefit to learning. Immediate imitation of movements while viewing them may be desirable, provided that such activity does not distract from the observation of the movements being demonstrated.

7. REVIEWS. In general, well motivated reviews of material or processes are beneficial to learning.

F. GENERALIZATION, APPLICATION, OR TRANSFER

1. GENERALIZATION SET. The tendency or ability of the learner to generalize what is learned, in applying it to new problems, is aided by a set or attitude toward generalization which is induced as part of the instructional presentation.

2. RECOGNIZED SIMILARITY. Generalization from the material learned to application of that learning is facilitated by recognized similarity of material learned to the actual task performances. Instruction should point out, and foster recognition of, such similarities.

G. CHARACTERISTICS OF THE LEARNER

A person's ability to learn is affected by his:

1. General mental ability (intelligence).

2. Educational level.

3. Previous knowledge or skill possessed in relation to specific material to be learned.

4. Special aptitudes, e.g. mechanical, spatial, verbal, perceptual speed, kinesthetic sensitivity (muscle sense).

5. Facility for learning through the eye or the ear.

6. Attitudes and interests.

7. Past experience with various teaching techniques such as lectures, films, etc.

II. THE AREA OF FILM CHARACTERISTICS AND THEIR EFFECTS ON LEARNING

Films have certain attributes not readily related to one or two learning principles, but instead related to a considerable number of them. The effects of some of these film variables on learning from instructional films are perhaps best investigated by means of hypotheses relating to the film characteristics themselves. The purpose of such investigations would be to determine the relative effectiveness of these film variables under various conditions of learning. Representative film characteristics which lend themselves to evaluation are:

A. COLOR: in portraying natural characteristics, stressing certain parts or features, enhancing esthetic appeal, etc.

B. MUSIC

C. EMPHASIZERS TO DIRECT ATTENTION: novelty, size, contrast, isolation, rhythm, rhyme, etc.

D. VOICE CHARACTERISTICS

E. MULTIPLE SENSORY PRESENTATION: i.e., presenting material through both picture and sound track.

F. ESTHETIC TONE OR ARTISTIC QUALITIES

G. EMOTIONAL TONE

H. DRAMATIC VS. FACTUAL PRESENTATION

I. HUMOR

J. PERSONALIZED COMMENTATOR: well-known person, commentator off-stage, commentator shown in picture, lip-synchronous dialogue.

K. UNITS CLEARLY MARKED OFF: with use of pauses, fade-outs, titles, statements by commentator, etc.

L. PACING AND RATE OF DEVELOPMENT

M. VERBALIZATION CHARACTERISTICS: relative amount and kind of verbal commentary, level of difficulty, personal reference, use of nomenclature, etc.

N. TIME RELATIONS OF SOUND TRACK AND PICTURE

O. FACT FREQUENCY AND FILM LENGTH

P. ANIMATION: e.g. use of animation sequences to achieve simplification, or to show things which cannot be actually photographed.

Q. MODIFIED MOTION: slow motion, speeded-up motion.

R. CAMERA VIEWPOINT AND PERSPECTIVE: 0^{c} vs. 180^{o}; use of wide angle, long focus lenses for special perspective effects.

III. THE AREA OF DEVELOPMENT OF NEW EQUIPMENT AND PROCEDURES FOR TESTING INSTRUCTIONAL FILMS

To facilitate research, new equipment for classroom testing of films and for recording audience reactions to films must be developed. The efficient utilization of the new equipment will require the development of new standard procedures. This is a third major area for research.

IV. THE AREA OF RESEARCH ON METHODS OF UTILIZING FILMS IN INSTRUCTION

Typical problems in this area might be:

1. Can films be used as an exclusive means of instruction?
2. Are study guides a useful aid to learning from instructional films?
3. Is learning increased by supplementing sound motion pictures with related film strips?
4. Should a number of films be shown in a single training session, or should the films be spread over several days?
5. How many times should a film be shown for optimum effect on learning?
6. Does the insertion of questions or reinforcing statements in films result in more complete learning?
7. What is the value of note-taking during film showings?

Research in this area also includes investigation of a number of technical considerations as for example:

1. Quality of picture projection and sound reproduction necessary for effective instruction by films.
2. Effect of viewing conditions on learning from instructional films; e.g., ventilation, seating arrangements, screen-viewing angle and distance, screen brightness, degree of room-darkening, contrast between screen and surroundings, and room-acoustics.
3. Rear projection, under daylight conditions.

Some of the problems in this area have already been subjected to an appreciable amount of research; others are being currently investigated by the Instructional Film Research Program.

V. THE AREA OF REVIEWS OF PERTINENT LITERATURE AND THEORETICAL SYSTEMS

The successful prosecution of any research program depends upon a thorough knowledge of what has been done, and what is being currently studied in the field of the research. This is a final and most fundamental area for investigation.

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